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PATENT

Attorney Reference Number 6047-51973
Application Number 09/321,518

#15 Response
N/E M. Brunson
7/18/02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Gilton et al.

Art Unit: 2814

Application No. 09/321,518

Filed: May 27, 1999

For: SEMICONDUCTOR FABRICATION METHODS AND APPARATUS

Examiner: W. Louie

Date: July 3, 2002

CERTIFICATE OF FACSIMILE

I hereby certify that this correspondence and any documents referred to as being transmitted herewith are being facsimile transmitted to the Patent and Trademark Office via 703-308-7722 on July 3, 2002.

Attorney for Applicant

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RESPONSE TO FINAL OFFICE ACTION

This responds to the Office action, dated May 10, 2002.

REMARKS

Claims 39-56 are pending in the present application. Reconsideration is requested.

Claims 39-41, 43-48, and 50-55 are rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by U.S. Patent No. 5,762,755 to McNeilly et al., (hereinafter McNeilly). Claims 42, 49, and 56 are rejected under 103(a) as allegedly being unpatentable over McNeilly in view of U.S. Patent No. 4,795,497 to McConnell et al., and U.S. Patent No. 4,946,549 to Bachman et al.

A telephone interview was conducted with Examiners Louie and Wille on June 7, 2002. As applicants' attorney pointed out in the interview, McNeilly is distinguishable from the claims of the present application because McNeilly does not suggest or disclose a liquid solvent layer on a wafer that serves as a transport medium for a reactive gas, as recited in the claims.

In contrast to applicants' claimed invention, McNeilly discloses an apparatus 1 in which ozone is introduced into a chamber 2 for pre-cleaning contaminants from a wafer. During the

pre-cleaning step, the wafer is heated to about 250° C. See col. 12, line 15. Following the pre-cleaning step, the wafer is etched using conventional etching techniques (either vapor phase HF/H_2O oxide or Cl_2/UV silicon etching). See col. 2, lines 29-32 and FIG. 1. If vapor phase HF/H_2O oxide etching is used, the wafer must be cooled to about 20° C to 80° C prior to etching. See col. 12, lines 16-17. McNeilly states that the proper etching "temperature has to be accomplished on a cyclic basis to provide repeatable performance, and must be quickly accomplished to assure high throughput in processing equipment." See col. 1, lines 56-60. Thus, in order to adequately cool the wafer in the least amount of time, it is implicit that the high temperature ozone is evacuated from the chamber before the etching solution (e.g., HF/H_2O) is introduced into the chamber.

During HF/H_2O etching in the McNeilly apparatus, HF/H_2O vapor condenses to form a liquid layer on the wafer. However, unlike applicants' invention, the HF/H_2O liquid layer cannot serve as a transport medium for a reactant gas (e.g., ozone) in McNeilly, because, as noted above, the ozone is evacuated from the chamber before the HF/H_2O is introduced into the chamber for etching the wafer.

As set forth below, all of the independent claims in the present application recite a film or layer of liquid solvent that serves as a transport medium for a gas that chemically reacts with a surface of a wafer.

Claim 39 recites "a film of liquid solvent" comprising "a transport medium which carries at least some of the at least one reactive gas through the film to said at least one of the first and second wafer side surfaces where the at least one reactive gas chemically reacts with said at least one of the first and second wafer side surfaces."

Claim 42 recites a "liquid solvent layer transporting ozone gas to the surface of the wafer to thereby expose the wafer surface to ozone."

Claim 44 recites "a layer of liquid on at least one major surface of a wafer supported within the chamber, the liquid being selected so as to be substantially non-chemically-reactive with the reactant gas, whereby the reactant gas is transported through the liquid layer to the wafer surface, the reactant gas being selected so as to chemically react with components on the surface of the wafer to clean the wafer."

Claim 46 recites "a film former adapted to condense a solvent to form a film of liquid solvent onto a surface of the wafer . . . [and] a gas exposer adapted to expose the film of liquid solvent to a source of at least one reactant gas . . . whereby reactant gas is transported through the film of liquid solvent to the wafer surface."

Claim 50 recites a "solvent layer [that] dissolves at least some of the at least one reactive gas in the film such that dissolved gas is brought into direct contact with and chemically reacts with the at least one of the first and second wafer side surfaces."

Claim 51 recites a "condensed liquid solvent compris[ing] a transport medium which dissolves at least some of the at least one reactive gas in the film to the at least one of the first and second wafer side surfaces where the at least one reactive gas chemically reacts with the at least one of the first and second wafer side surfaces."

Claim 55 recites a "liquid solvent compris[ing] a transport medium which dissolves at least some of the at least one reactive gas in the film where the dissolved gas is brought into direct contact with and chemically reacts with the at least one of the first and second wafer side surfaces.

Claim 56 recites a "liquid solvent compris[ing] a transport medium that dissolves at least some of the at least one reactive gas in the film where the dissolved gas is brought into direct contact with and chemically reacts with the at least one of the first and second wafer side surfaces."

Accordingly, for at least the foregoing reasons, McNeilly does not teach or suggest the apparatus claimed in the present application and the rejections of the claims should be withdrawn.

CONCLUSION

The present application is in condition for allowance and such action is respectfully requested. If any further issues remain concerning this application, the Examiner is invited to call the undersigned to discuss such matters.

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Respectfully submitted,

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